UNIVERSITY OF TECHNOLOGY, SYDNEY

Match running performance and physical fitness in youth soccer players: A longitudinal study

A thesis submitted for the degree
Master of Sport & Exercise Science
January 2015
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Certificate of Original Authorship

I certify that the work in this thesis has not previously been submitted for a degree at the University of Technology Sydney nor has it been submitted as part of requirements for a degree except as fully acknowledged within the text.

I also certify that the thesis has been written by me, Ben Michael Simpson. Any help that I have received in my research work and the preparation of the thesis itself has been acknowledged. In addition, I certify that all information sources and literature used are indicated in the thesis.

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Signature of Student

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Date

Acknowledgements

The completion of this thesis was made only possible by the support and encouragement of the following people.

The following three gentlemen in their own ways made this achievement possible and realistic for me. Without their continual guidance I am not sure where I would be today, both at professional and personal levels. Professor Aaron Coutts has gone over and above what was definitely required of him, I only wish that I could be as efficient and effective as he is and repay his generosity. Being an off-campus student, proved difficult at times, but Aaron stood by me, helpful by all means along the way! Professor Martin Buchheit, not only the support provided from an educational prospective, but as a friend and someone I look up to everyday, thank you for always believing in me. You know I can never repay what you have provided me and continue to do for me. Thank you. Dr. Alberto Mendez, thank you for firstly giving me the chance to join your team of Physiologists with Aspire football. To this day and beyond I will never stop learning from you, my Spanish inspiration! The above three have guided and assisted me more than what is probably required, I thank them all for their individual help.

I would also like to thank Dr. Hani Al Haddad for his support as a colleague and friend, the coaching staff and each and every player at ASPIRE – Sports Academy that I have had the pleasure of working with.

This research received financial support provided by ASPIRE – Sports Academy.

Preface

This thesis for the degree of Master of Sport and Exercise Science is in the format of ready for submission manuscripts and abides by the 'Procedures for Presentation and Submission of Theses for Higher Degrees – University of Technology, Sydney; Policies and Directions of the University'. All manuscripts included in this thesis are closely related in subject matter and form a cohesive research narrative.

Based on the research design and data collected by the candidate, one paper has been prepared for submission to an international, peer-reviewed journal. This thesis is brought together by an *Introduction*, which provides background information, defines the research problem and the aim of each study. The a *Literature Review* provides an overview of previous knowledge that characterizes match running performance and physical capacities of youth level soccer players, methods to measure the link between match running performance and physical fitness and means to improve those variables.

This manuscript outlines and discusses the individual methodology and the findings of the study. The *General Discussion* chapter provides an interpretation of the collective findings and practical applications from the series of investigations conducted. To finish, a *Conclusion and Practical Implications* chapter summarizes the conclusions from the project. Future research is suggested on the basis of the findings from the studies. The APA reference style has been used throughout the document and the reference list is at the end of the thesis.

ABSTRACT

This study examined whether substantial changes in either maximal sprinting speed (MSS) or maximal aerobic speed ($V_{vam\text{-}Eval}$) are related to changes in match running performance activity during match play in highly-trained young soccer players. A retrospective longitudinal research design was used where physical fitness and match analysis data were collected. Data from 44 players (U13-U18; fullbacks [FB, n=12], centre-backs [CB, n=12], mid-fielders [MD, n=11], wide-midfielders [WM, n=5], strikers [S, n=4]) who had substantial changes in either MSS or $V_{vam\text{-}Eval}$ throughout 2 consecutive testing periods (~3 months) were included in the final analysis. For each player, time-motion analyses were performed using a global positioning system (1-Hz) during 2-10 international level games played within 1-2 months from/to each testing period of interest. Match activity profiles were described using both absolute and relative zones. Absolute match running activities were defined as meters per min ($m \cdot min^{-1}$), low-intensity activities (LIA), high-intensity running (HIR), very high-intensity running (VHIR) and sprint activities (SPRT), where relative match activities were categorized into 5 intensity zones in relation to individual MSS and MAS. Improvements in both MSS and $V_{vam\text{-}Eval}$ were likely associated with either non-substantial or lower magnitude changes in match running performance variables and between playing positions. While in response to using relative thresholds, measures were either unchanged or decreased substantially in response to an increase in MSS and/or MAS. Collectively, the results demonstrate that in match running activities during games do not necessarily match those in physical fitness in highly trained young soccer players. Game tactical and strategic requirements are likely to modulate on-field players' activity patterns independently of players' physical capacities.

Keywords

Developing players

Football

GPS

High-intensity running

High-speed activities

Individual intensity thresholds

Locomotor function

Low-intensity running

Match analysis

Physical fitness

Time-motion analysis

List of Abbreviations

ASR	anaerobic speed reserve
CB	centre-back
CI	Confidence Interval
cm	centimetres
CMJ	counter movement jump
CV	coefficient of variation
ES	Standardised effect size
FB	full-back
GPS	Global Positioning System
GXT	graded exercise test
HIR	high-intensity running
HR	heart rate
Hz	Hertz
ISAK	International Society for the Advancement of Kinanthropometry
kg	kilograms
km/hr	Kilometers per hour
KMS	kinematic measuring system
LIR	low-intensity running
m	meters
MAS	Maximal aerobic speed
MD	mid fielder
min	minute
MSS	maximal sprinting speed
p	significance
PHV	peak height velocity
PSV	peak strength velocity
PWV	peak weight velocity
r	Pearson's correlation coefficient
RCT	Respiratory compensation threshold
RSA	repeated sprint ability
RSA_{mean}	repeated sprint ability mean
s	seconds
S	striker
S1	speed zone 1
S2	speed zone 2
S3	speed zone 3
S4	speed zone 4
S5	speed zone 5
SD	standard deviation
SPRT	sprinting
TD	total distance covered
U13	Under 13 years of age

U14	Under 14 years of age
U15	Under 15 years of age
U16	Under 16 years of age
U17	Under 17 years of age
U18	Under 18 years of age
UMTT	Universal of Montreal Track Test
VHIA	very high-intensity activities
VHIR	very high-intensity running
VJ	Vertical Jump
VO_2max	maximal oxygen uptake
V_{vam}-Eval	peak running speed during an incremental field test
WM	wide-mid fielder
Yo-Yo IE2	Yo-Yo Intermittent endurance test 2
Yo-Yo IR1	Yo-Yo Intermittent recovery test 1

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